EXHIBIT B

Part 4 of 6

Regen at Idle Cycle must not exceed the value as produced by Ford under equivalent operating conditions.

- For modifications to Gas engine exhaust systems: the Maximum WOT Backpressure as measured at the manifold outlets must not exceed the value as produced by Ford under equivalent operating conditions.
- Exhaust pipe extensions or added segments must be of equivalent diameter, gauge, and material as that originally provided by Ford. This will maintain proper corrosion protection and durability.
- If the exhaust system length is modified, incremental hangers/isolators should be considered or existing hangers/isolators may need to be strengthened. Do not use rigid connections to the body. Consider thermal expansion of materials and the effect on static and dynamic clearances. Maintain ground clearance at the current production height.
- The minimum clearance between the exhaust system and surrounding critical components must maintain OEM clearances. Additional shielding may be needed for any modifications.
- Do not reuse the exhaust system clamps, fasteners, or gaskets. Replace them with new parts. Use Ford replacement parts or equivalent.
- If it is necessary to cut the exhaust pipe, use a saw or tube cutter, not a torch. Torch cutting leaves an uneven surface, which is a potential cause of exhaust leaks.
- Cut only on a horizontal straight segment of pipe.
- The tip of the exhaust outlet should protrude beyond the vertical surface of the Second Unit Body. If necessary, an extension should be added to the exhaust outlet pipe to direct exhaust away from the body and minimize the possibility of fumes entering the vehicle.

Wheels and Tires

WARNING: Use only replacement tires that are the same size, load index, speed rating and type (such as P-metric versus LT-metric or all season versus all-terrain) as those originally provided by Ford. The recommended tire and wheel size may be found on either the Safety Compliance Certification Label or the Tire Label which is located on the B-pillar or edge of the driver's door.

WARNING: Dual rear wheel vehicles may be shipped with the outer rear wheels removed. The dealer or alterer must ensure that the lug nuts are torqued to the proper specification before the vehicle is delivered to the final vehicle purchaser. Improperly tightened lug nuts could loosen and allow the wheel to come off while the vehicle is in motion, causing loss of control.

Use only wheels with the same load capacity, rim width, rim offset, and mounting configuration as those originally installed on the vehicle.

If the wheel lug nuts are loosened or removed for any reason, torque them to the specifications as listed in the applicable Owner Guide.

Tire Pressure Monitoring System (TPMS)

The Tire Pressure Monitoring System is subject to interference from the addition of metallic structures between the wheel-mounted sensor transmitters and the on-board receiver. Additionally, TPMS is subject to interference from any added equipment or device that emits radio frequency (RF) energy.

Even without interfering factors, the TPMS system has a maximum distance between the wheel sensors and receiver within which the system is robust. Do not extend the vehicle wheelbase beyond the longest factory offered variant with TPMS for the vehicle line in question, unless specifically mentioned in the IVM or program specific BBLB.

For Dual Rear Wheel Vehicles, it is important that the inside and outside wheel have valve stems positioned 180 degrees apart.

Brake System

WARNING: Do not wrap brake lines with any material that could cause water, dirt, sand or other foreign material to accumulate around the lines, potentially causing brake line damage or corrosion.

Guidelines for modification of hydraulic service brakes lines:

- Before and after cutting brake lines, drain, recover, clean up, and remove all the brake fluid, including drippings, from the area. Brake fluid is flammable. Discard all drained fluid appropriately.
- Remove the steel brake line from the frame clips. Avoid bending or crimpling the lines.
- Cut the brake lines on a straight segment parallel to the frame. Some brake lines have a hardened wire wrap for chafe protection. It is recommended that the wire wrap and the brake line be cut by grinding. Other industry cutting methods are acceptable as long as tubing integrity is maintained, and care is taken to prevent contaminants from entering the lines.
- All splicing of brake tubing must be done with steel tubing, threaded fittings, double flared joints, and brass unions of equivalent OEM quality. Use only SAE J526 or J527 steel tubing or equivalent.
- Do not kink or crack tubing when forming extensions of the existing tubing.
- Secure the brake lines to the frame with clips and clip spacing similar to that used with the original brake tubing.
- Inspect the modified brake lines for possible chafe or rattle conditions with the frame, fasteners, or other lines. Wire wrap tubing in the areas that may require additional protection.
- Do not reuse recovered brake fluid as it may contain contaminants. Always replace the fluid with new OEM equivalent brake fluid.
- Bleed the brake lines; check for leaks per the Ford shop manual. Verify the system operation and function.

Guidelines for modification of Parking Brake cable system:

- Remove the parking brake cables from areas of modification to avoid damage. These cables are particularly sensitive to heat.
- Measure and record the exact position of the parking brake cable side rail bracket relative to the forward edge of the rear spring front hanger bracket (see Figure 18). This dimension is critical to the reconnection procedure, as the bracket must be remounted in the original OEM position relative to the spring hanger bracket.
- If necessary, remove the parking brake cable bracket located on the frame side rail. Care should be taken when removing the bracket to maintain its integrity and shape if this component will be remounted.
- For wheelbase modifications, a new intermediate cable, modified in length consistent with the frame change, will be required.
- Any new brake cables must be of OEM quality or equivalent.
- If necessary, reinstall the parking brake bracket on the frame side rail in the same position relative to the front edge of the rear spring front hanger bracket.
- Parking brake cable brackets should be welded to the frame, avoiding welding in the corners and utilizing standard industry practices for maximum weld integrity.
- Parking brake cable bracket attachment to the frame must be able to withstand a tension load of 800 pounds, without any significant deflection. See Figure 19.
- After final welding, repaint the exposed portion of the frame.

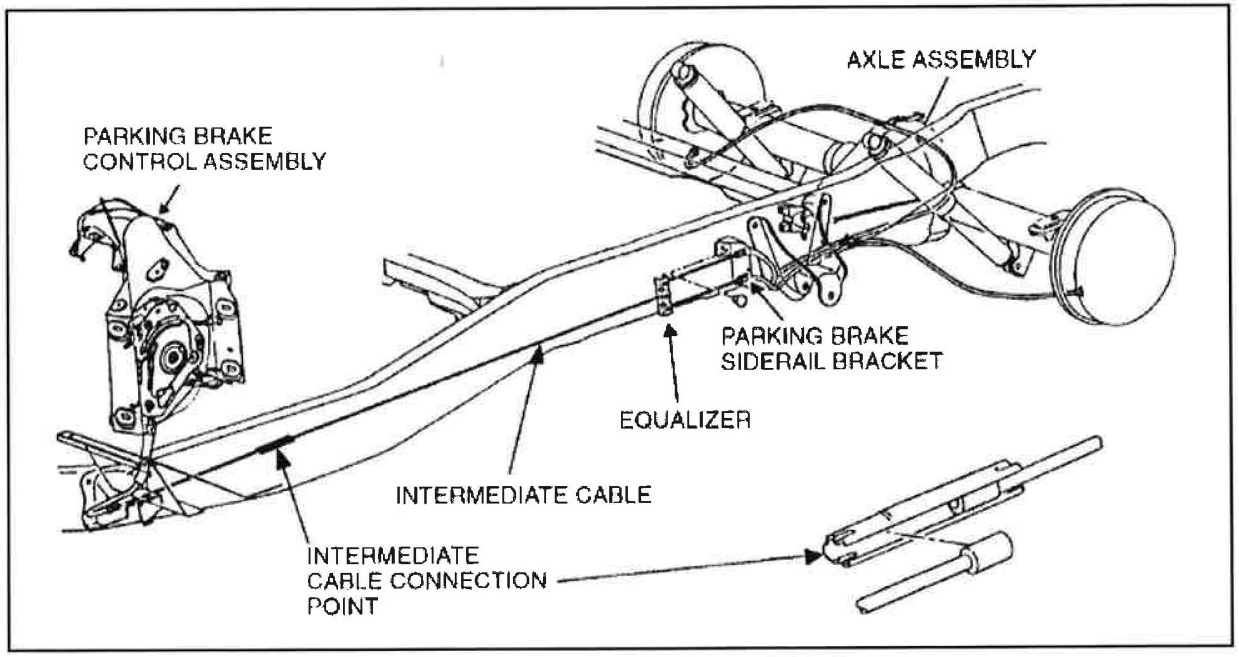


Figure 18 – Example of Parking Brake Cable System

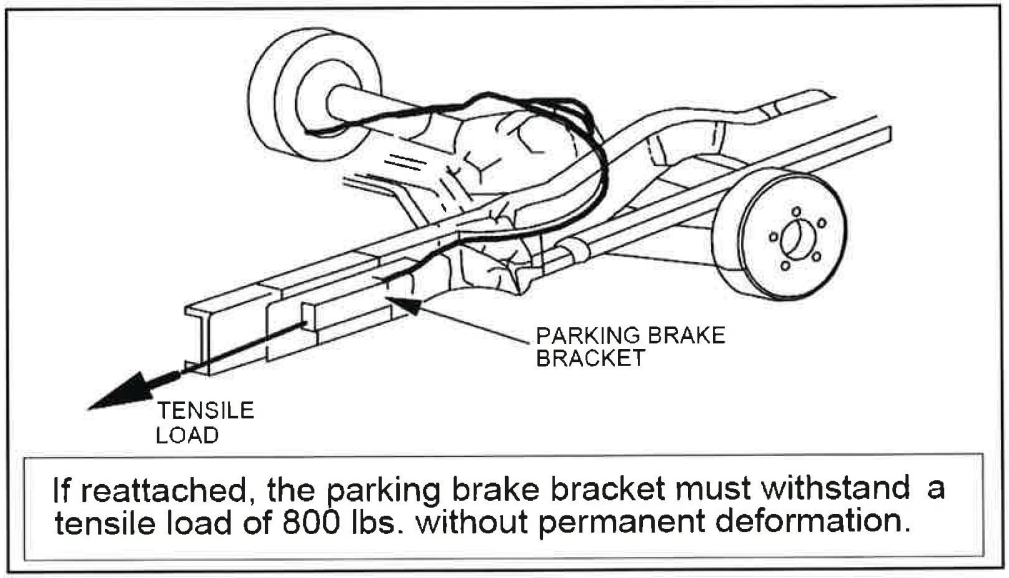


Figure 19 – Parking Brake Bracket Strength

Suspension and Steering System

IMPORTANT: The final-stage manufacturer is responsible for verifying that the front wheel alignment is within Ford specifications on completed vehicles. The steering wheel clear vision (horizontal or level orientation of the steering wheel) should also be maintained when resetting wheel alignment. These specifications are found in the "Suspension System - General Information" section of the Ford Shop Manual.

IMPORTANT: The steering gear, intermediate shaft, coupling shaft, linkage, column, and steering wheel should not be altered nor relocated. Steering linkage travel should not be restricted.

IMPORTANT: The weight of the body structure and its center of gravity location (both horizontally and vertically), as well as the weight and positioning of the cargo load, are important to the handling of the completed vehicle. Subsequent stage manufacturers should note that matching a body to a chassis in a manner appropriate for the intended use of the vehicle is the responsibility of the final stage manufacturer. Following the representations in the Incomplete Vehicle Manual, with respect to center of gravity locations and body weights for compliance with Federal or Canadian Motor Vehicle Safety Standards is only part of the task of producing a completed vehicle that handles appropriately in service.

IMPORTANT: Modifications made by subsequent stage manufacturers, particularly those that significantly affect vehicle ride heights or off-loading of vehicle weight from the front of the chassis (frame stretch, addition of a lift gate, etc.) may cause increased tire wear and/or vehicle control problems, possibly leading to rollover or other accidents that could result in death or serious injury.

NOTE: Front end alignment warranty policy for incomplete vehicles is based upon the completed vehicle remaining within OEM weight ratings, vehicle attitude, suspension and wheel/tire guidelines, and other characteristics affecting wheel alignment. Exceeding or modifying these restrictions may jeopardize related warranty.

The following recommendations should be followed:

- Front or rear suspension components should not be drilled, cut, welded, or relocated for any reason.
- Welding to the frame in proximity to the steering gear is not recommended.
- If rear suspension spacers are used between the spring and axle seats to accommodate side-to-side variations, they should not exceed 3/8 inch. The spacers should not exceed the profile of the axle spring seat. Additional spacing may adversely affect driveline angles and axle system package clearance. Also affected are spring stress limits from excessive jounce travel.
- Do not use any suspension component as a welding ground.
- When welding or cutting near suspension components, shield and protect all springs and rubber components from heat penetration and welding splatter.
- Any add-on device mounted on the steering column, shroud, multifunction switch, or gear selector lever, must not affect steering column angles, tilt mechanism (if so equipped), range of operation, or steering column mounting hardware. Any such device must not interfere with steering column collapse stroke travel during crash situations or air bag deployment.
- Vehicles equipped with an air suspension system must verify that the settings are correct once the vehicle is completed by the final stage manufacturer. The applicable settings and process are found in the "General Procedures" folder in the Rear Suspension Section of the Ford Shop Manual

Engine

The following recommendations should be heeded to ensure proper engine performance:

- The engine should not be operated with the hood up or removed. This may allow excessive unforced air to circulate, potentially having an adverse effect on the cooling system.
- Do not use manual throttle kickers.
- When using electronic throttle kickers on gasoline engines, set the high idle RPM at as low as possible to obtain the required performance. The idle speed must be set when the engine is at normal operating temperature and under normal load. This RPM setting should be affixed to the vehicle and should be checked after the 2,000 mile brake-in engine tune up. The addition of throttle kickers may affect electronic transmission operation.
- An auxiliary crankshaft bearing support is required on all modular gas engines before a FEAD-mounted PTO can be installed.
- Do not tap into the electrical circuits attached to the Accelerator Pedal Position (APP) Sensor on the accelerator control. Do not bypass the electrical circuits attached to the APP.
- Installation of a gasoline engine speed governor is permissible, provided the governor design is compatible with each respective throttle body for the individual engine application and it does not exceed the specified engine maximum RPM. It must also meet all noise and engine emission requirements. Governor installations may affect electronically controlled transmissions. Contact the Ford Truck Body Builders Advisory Service before installing. Ford Motor Company also offers OEM production options for speed limiting on multiple vehicle lines, see vehicle Order Guides for additional information.

Transmission

The following recommendations should be heeded to ensure proper function of the transmission system:

- The transmission oil filler tube and dipstick must not be altered by bending, lengthening, or shortening, and must be readily accessible for checking lubricant level. NEVER ATTACH ANY COMPONENT TO THE TRANSMISSION FILLER AND DIPSTICK TUBE.
- The installed engine angle must not be altered. The relative position of engine and transmission to shift linkage must not be altered.
- Transmission vent must not be altered, pinched, or collapsed, and the vent opening must not be restricted or relocated.
- Adequate tool clearance and suitable access openings for transmission adjustments must be provided. Transmission removal provisions must also be considered.
- Transmission oil cooler lines should not be kinked, bent, or restricted. All oil cooler lines must be properly retained with adequate clips. The truck type external oil cooler must not be "boxed in", which would restrict adequate air circulation. Use only Ford factory coolers. Some automatic transmissions are equipped with "Stand Alone" transmissions fluid coolers. Vehicles equipped with oil-to-air cooler (OTA) may not have a transmission fluid cooler in the radiator.
- Transmission shift cable, transmission outer shift lever, and shift cable bracket must not be altered and must have provisions for adjusting tool clearance. A severe duty shift cable (booted) is available as a service part, from a Ford Dealer, for Super Duty F-Series vehicles which experience extensive off-road use.
- Some automatic transmissions may be equipped with a transmission cooler bypass system. The purpose of the cooler bypass valve is to allow some transmission fluid to bypass the transmission fluid coolers and return to the transmission sump during cold weather operation. This provides a faster transmission fluid warm up and increased lube flow during cold weather operation. Do not remove nor modify this system or transmission damage may occur. Do not use the cooler bypass line as a fitting point. Vehicles equipped with transmission cooler bypass will NOT have a hot water feed circuit from the water pump to the radiator tank containing the transmission cooler.
- Electronically controlled automatic transmission wire harness routing location, wire harness locating clips, all heat shielding, and clearance to the exhaust must be maintained as installed by Ford.

Driveline

The following recommendations should be heeded to ensure proper driveline performance:

- Rear axle vent and hose, if installed, must not be bent, pinched, or obstructed so that normal "breathing" of the rear axle is provided.
- On all rear axle assemblies, additional bracket bars or supports must not be welded to the axle assembly. Attachment of any equalizing-type trailer hitch or auxiliary suspension systems (springs) must not be attached to the rear axle assembly.

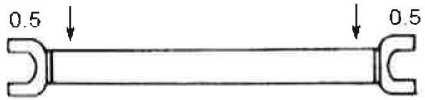
When removing a driveshaft, follow these recommendations:

- Match-mark the driveline attachment at the transmission or transfer case and rear axle before it is removed. This will assure identical reinstallation that is critical to driveline balance and phasing.
- If a driveshaft is modified, it should be rebalanced and the new high spot mark should be compared to the previous.
- Retain and tape the bearing caps to the universal joints to assure needle bearing integrity.

Driveline Balance, Runout and Sizing

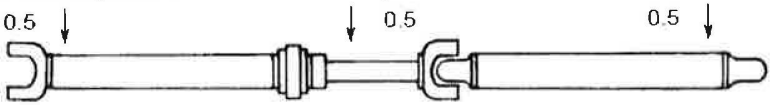
See Figure 20 for guidelines on Driveline balancing. In general, limit the amount of balance weight to approximately 3 ounces or less at each end of the shaft. If excessive weight is required for balance, it is likely that the shaft is distorted beyond the runout specifications and should not be used. Compare the shaft runout against the specifications listed below to determine if any given shaft is worth balancing.

A. INDIVIDUAL DRIVESHAFTS: Maximum imbalance of 0.5 ounce-inch at both ends.



B. MULTIPLE DRIVESHAFT SYSTEMS SHOULD BE SYSTEM-BALANCED

1. TWO-PIECE DRIVESHAFT SYSTEMS: Maximum imbalance of 0.5 ounce-inch at both ends of the system, and at the center of the system where the shafts are joined.



2. THREE-PIECE DRIVESHAFT SYSTEMS: System-balance two of the shafts as in "B", then assemble the third after it has been balanced individually as in "A".

C. Balancing of the driveshaft, or system, should be done at 3,000 rpm.

D. Balance weights should be placed within 3.0 inches from the ends of the driveshaft tube, and no closer than 1.0 inch from a weld.

Figure 20 – Driveline Balancing Guidelines

See Figure 21 for guidelines on runout limits for unbalanced drive shafts

See Figure 22 for guidelines on shaft diameters

Some drive shafts may have an internal damper which may need to be re-tuned if the driveshaft length is modified. The presence of an internal damper can be confirmed visually when the driveshaft is "open" for modification.

To meet minimum shaft quality requirements, the shaft should be made from cold-rolled steel, 0.083-inch minimum thickness. Weld seam to form a tube.

Driveline Angles

After the vehicle build is complete, the driveline angles must meet the following "rules", both at unloaded and fully-loaded vehicle attitudes.

1) The NET OPERATING ANGLE, at any individual joint, must be at least 0.5 degree, and not exceeding 3.0 degrees. The NET OPERATING ANGLE (Θ) is equal to the root sum of squares (RSS) of the side and plan view angles between two segments of the drivetrain (See Figure 23). Figure 24 illustrates a typical driveline system. Using this figure, the Net Operating Angle of each joint would be calculated as shown in Figure 25.

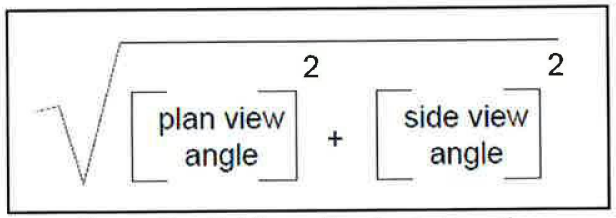


Figure 23 – Net Operating Angle Equation

2) The combination of NET OPERATING ANGLES, throughout the whole driveline, must "cancel." It is preferred that the NET OPERATING ANGLES at either end of a shaft be within 1 degree of each other. At a minimum, the formulas in Figure 26 must be satisfied for sufficient "cancellation" to occur:

3) The center bearing mounting bracket, surrounding the rubber insulator, must be 90 +/- 3 degree to the center bearing. In other words, no more than 3 degrees of misalignment can be absorbed by the rubber surrounding the center bearing. See Figure 28.

Driveline Component Phasing: Ensure that u-joints are in-line to within +/- 2 degrees, See Figure 27. Ensure matching alignment arrows between slip yoke and tube shaft. Observe alignment arrows stamped on parts. If there are no alignment marks, add them before disassembly to ensure proper phasing alignment of shaft and yoke. See Figure 29.

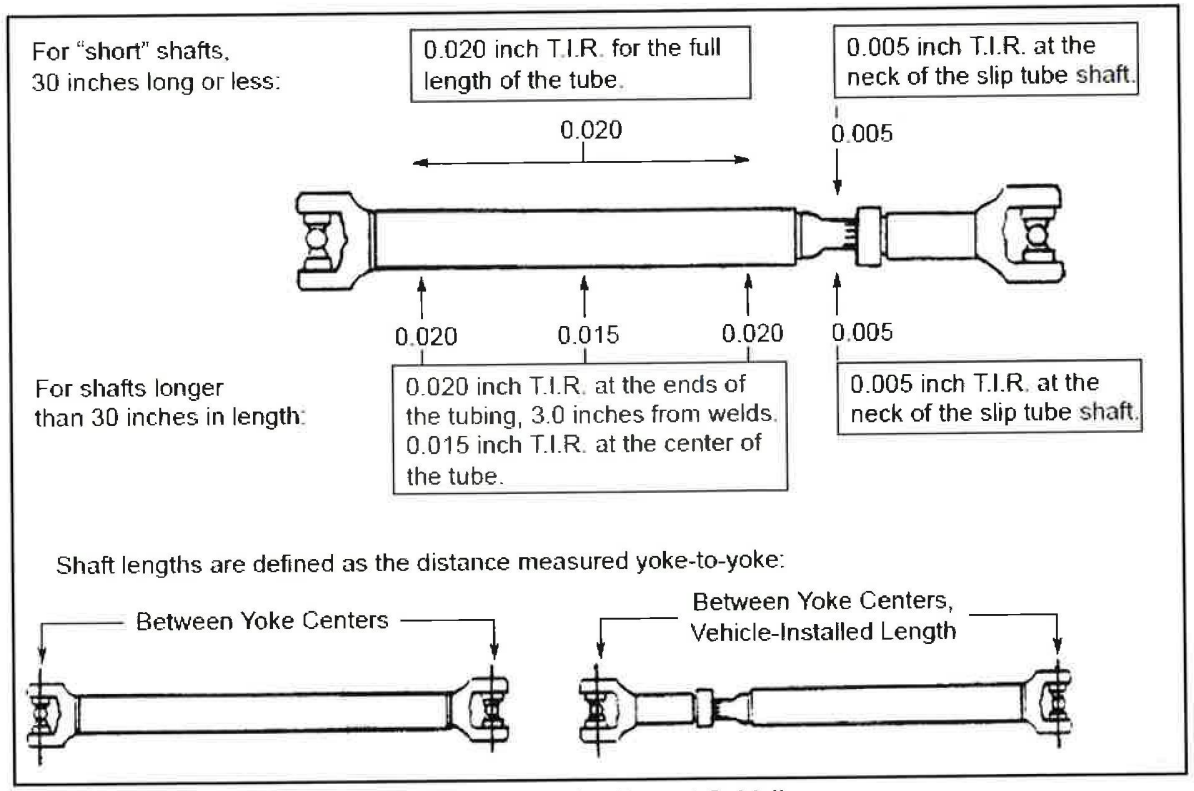


Figure 21 – Driveline Runout Guidelines

If the shaft length is:	Then the minimum shaft diameter should be:
0 to 51 inches long	> 3.0 inch
Up to 55 inches long	> 3.5 inch
Up to 59 inches long	> 4.0 inch

Figure 22 – Driveline Diameter Guidelines

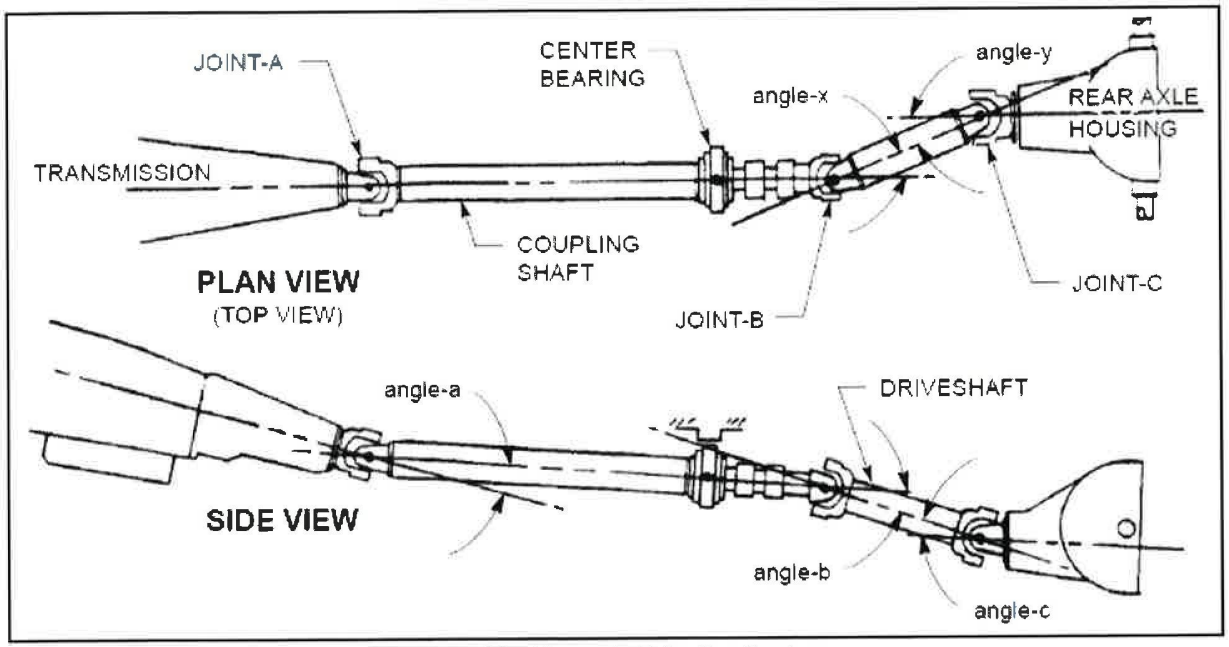


Figure 24 – Example Driveline System

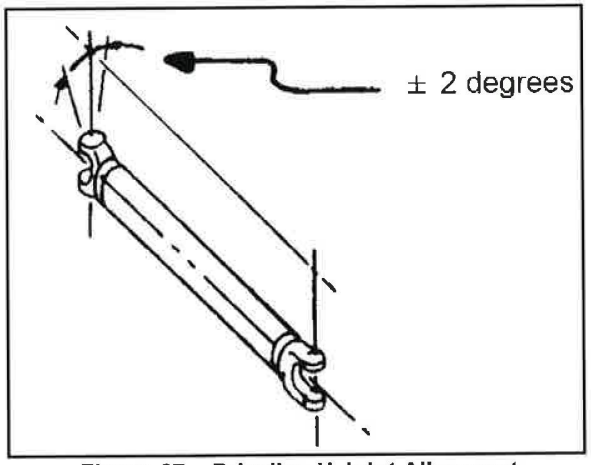


Figure 27 – Driveline U Joint Alignment

The NET OPERATING ANGLE at JOINT A = (Θa) =	$\sqrt{[0]^2 + [\text{angle-a}]^2}$	≥ 0.5° ≤ 3.0°
The NET OPERATING ANGLE at JOINT-B = (Θb) =	$\sqrt{[\text{angle-x}]^2 + [\text{angle-b}]^2}$	≥ 0.5° ≤ 3.0°
The NET OPERATING ANGLE at JOINT-C = (Θc) =	$\sqrt{[\text{angle-y}]^2 + [\text{angle-c}]^2}$	≥ 0.5° ≤ 3.0°

Figure 25 – Example Net Operating Angle Calculation

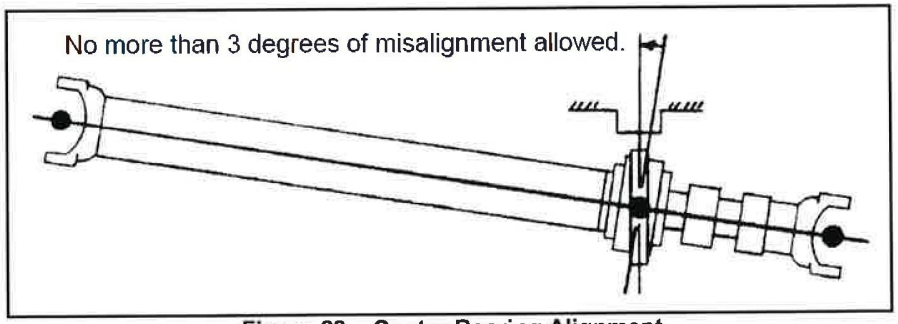


Figure 28 – Center Bearing Alignment

For a 1-shaft driveline: (2-joint)	$\sqrt{\Theta a^2 - \Theta b^2}$	≤ 3.0
For a 2-shaft driveline: (3-joint) (as exemplified in Figure 1)	$\sqrt{\Theta a^2 - \Theta b^2 + \Theta c^2}$	≤ 3.0
For a 3-shaft driveline: (4-joint)	$\sqrt{\Theta a^2 - \Theta b^2 + \Theta c^2 - \Theta d^2}$	≤ 3.0

Figure 26 – Net Operating Angle Minimum Cancellation

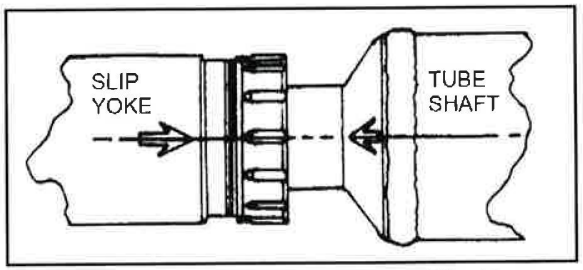


Figure 29 – Component Alignment Markings

Frame

WARNING: Failure to follow the recommendations below may weaken the vehicle frame, which could result in death or serious injury.

WARNING: When welding is performed anywhere on the vehicle, precautionary measures should be taken to prevent damage to electrical system wiring or components.

WARNING: The stability control system (if equipped) is specifically calibrated and validated only for the vehicle's original configuration. Significant vehicle alterations such as wheelbase extensions or reductions, or addition of a tag axle will affect the performance of the stability control system.

The following recommendations should be heeded to maintain proper function and performance of the vehicle frame:

- Use existing holes in the frame whenever possible.
- Holes are not to be drilled in the top or bottom flange of the frame side member, or in locations on the vertical frame side that would weaken the frame.
- Holes to mount brackets, out-riggers, and supports, may be drilled in the vertical frame side rail web with the following restrictions:
  - There must be a minimum of 1.5 inches of material between edge of hole and inside of upper or lower flange.
  - The minimum edge distance between any two holes up to 0.625 inch diameter must be 1.00 inch. For holes larger than 0.625 inch diameter, the minimum edge distance must be 1.5 times the diameter of the largest hole.
  - The maximum hole diameter for any hole in the frame is 0.75 inches.
  - Avoid drilling holes within 0.5 inch from the edge of any existing or added reinforcement.
- Avoid close vertical succession of fasteners (3 holes max).
- Adding holes or welding on frame cross members is not recommended.
- All attaching fasteners, including flat washers, must be of high strength steel (Grade 8 for SAE fasteners, Property Class 10.9 for metric bolts, PC 10 for metric nuts).
- Prior to welding, any parts which could be damaged by excessive temperatures should be removed or adequately shielded. Also, prior to welding, disconnect all batteries, and sensitive electronic modules (PCM, BCM etc.).
- Ensure the welder ground return clamp is positioned as close to the affected welding area as possible (not more than 12 inches). The welder ground return clamp should be on the same sheet metal or frame being welded upon. Welding cables should never be allowed to lay on, near, or across any electrical wiring or electronic component during welding. After welding, when parts are cool, carefully inspect wiring and electrical components for shorts or other damage which could draw excessive currents and possibly cause an electrical system short when the battery is reconnected.
- Do not weld on frame flanges, including the bend radii.
- When welding steel side rails, emphasis should be placed upon weld application techniques to avoid stress risers that may adversely affect frame operating stresses.
- When welding within 4 inches of any cross member or suspension rivets, remove the rivets and replace with appropriate threaded fasteners (Grade 8 for SAE fasteners, Property Class 10.9 for metric bolts, PC 10 for metric nuts). When welding within 4 inches of any bolted on cross member or suspension component, re-torque the fastener to the OEM torque specification.
- Do not modify or alter the convoluted frame sections in the area behind the front bumper. Modifications or alterations could have an adverse effect on vehicle performance in a crash situation.
- Recommend the use of OEM front tow hooks only. See the Owner's Manual for towing instructions.
- When U-bolts are used for the attachment of bodies to the truck chassis, vertical spacer bars must be used between the upper and lower flanges at each U-bolt to prevent collapse of the frame side rail flanges.

Wheelbase Modifications

Frame splices are often made too rigid. Good frame splice design will allow the frame to flex and twist along its entire length. It is recommended that the frame splice technique described here be adopted to retain splice joint integrity.

The critical aspects of frame splicing are cut location, alignment, and fit. A flat level work area is recommended. Jack stands should be properly located to stabilize the vehicle during the cutting operation. All of the tires should be blocked front and rear.

Carefully chose a location to cut and extend the frame based on the following criteria:

- Minimize exhaust, fuel, brake, and electrical modifications.
- Minimize driveline modification issues concerning excessive drive angles and misalignment (see Driveline section of this document for more information)
- Maintain frame strength and integrity.
- Achieve minimum weld spacing from the spring hanger bracket, preventing rivet hole deformation.

Once a location has been chosen, follow these recommended steps:

- Disconnect the battery negative cable(s) and the PCM, BCM and other sensitive electronic modules.
- Most Ford OEM frames are e-coated for improved corrosion protection. This paint must be ground off locally before the welding operation begins.
- The cut location must account for the outer reinforcement, which will be added in a later operation. The reinforcement should extend beyond the frame by a minimum of 6 inches on either end.
- Scribe or mark the frame for cutting (See Figure 30). All dimensions for gauging or fixturing should be recorded at this time.
- Attach a cutting fixture to the frame for increased cut accuracy
- Grind the cut edges of the frame smooth for a line on line fit. This will ensure a good and a clean metal surface for the welding operation.

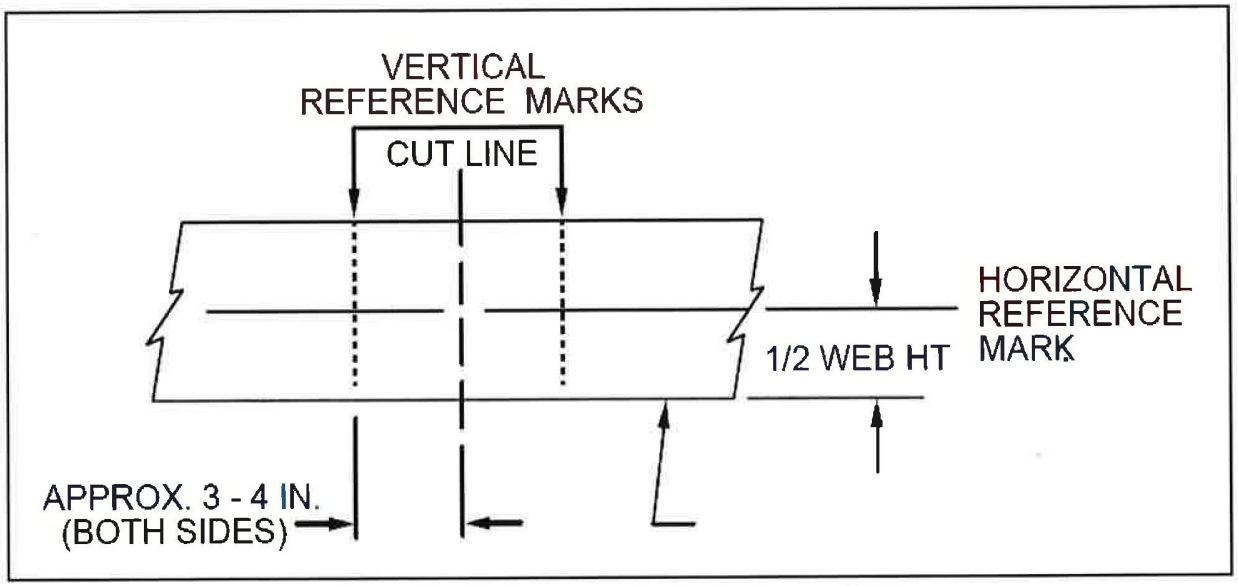


Figure 30 – Horizontal and Vertical Reference Marks

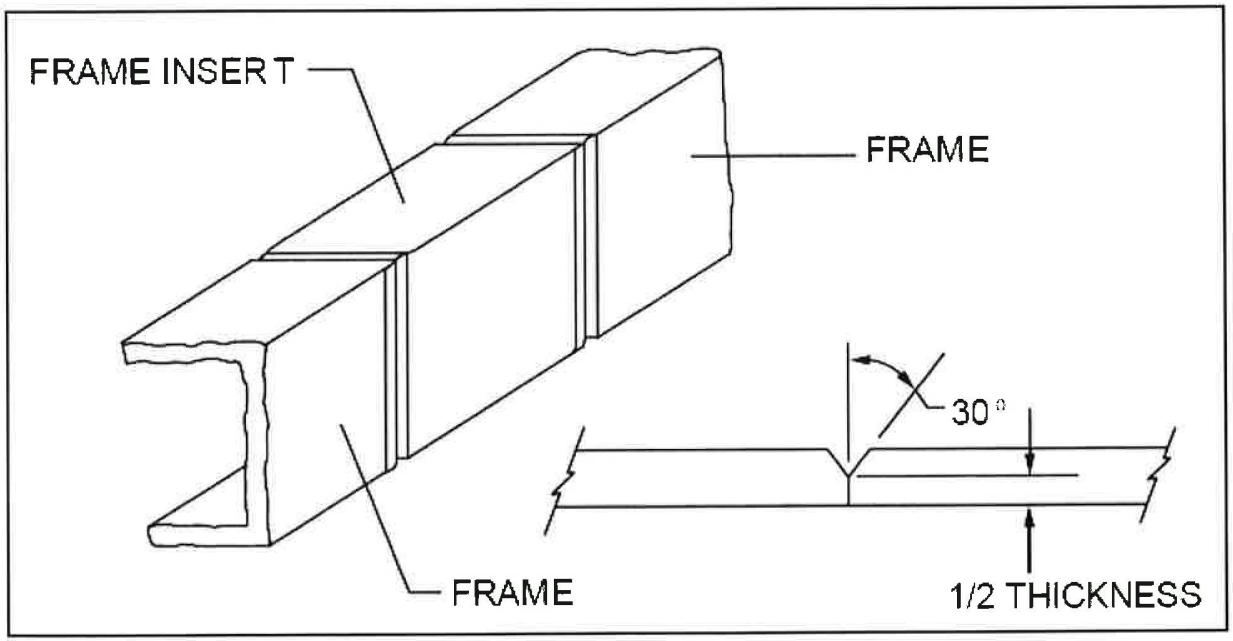


Figure 31 – Chamfered Frame Rails Prior to Welding

- Frame inserts must be the same dimensional shape, gauge, material, and yield strength as the original side members. Frame material and yield strength can be found on the Ford BBAS site (select "Publications", then expand "Vehicle Specifications" and select the applicable vehicle line.
- Chamfer the outside edges of both the frame cut and the insert ends at a 30° angle, leaving half of the thickness. (See Figure 31)
- Move the rear frame section of the vehicle in order to allow placement of the frame insert.
- Fixture and clamp the insert to ensure correct alignment. Dimensional checks to the predetermined reference marks should be used to prevent any possible error. (See Figure 32)
- Tack weld run-off blocks to the edge of the upper and lower flanges of the frame and frame insert (See Figures 33 and 34). This procedure is recommended to eliminate joint edge burnout and to prevent movement during the butt weld procedure.
- Butt weld the ends of the frame insert to the frame. Butt welds on the outside surface of the frame should be done with a single pass, vertical, up. (See Figure 33)
- Butt weld the inside of the joint with a single pass, vertical, up. (See Figure 34)
- Visually inspect all the welds for defects. Maintain high quality welds, as they are critical to joint integrity.
- Remove the run-off blocks and chip or grind the joint smooth. Grind marks are to be parallel to the length of the frame. The finished joint should be the same thickness as the side member.
  Note: The outside surface of the frame weldment must be as smooth as the rest of the frame to provide for a flush fit of the reinforcement.
- The splice location and the length of the insert define the outer reinforcement length with a minimum 6-inch overlap on each end. This reinforcement is not to encroach on the rear leaf spring front hanger bracket. Welding within 4 inches of this area could shrink the spring bracket rivets, causing a loose joint. The reinforcement should have an L-shaped cross section and be of the same material and thickness as the frame. The reinforcement height must allow for the weldment and not extend above the tangent of

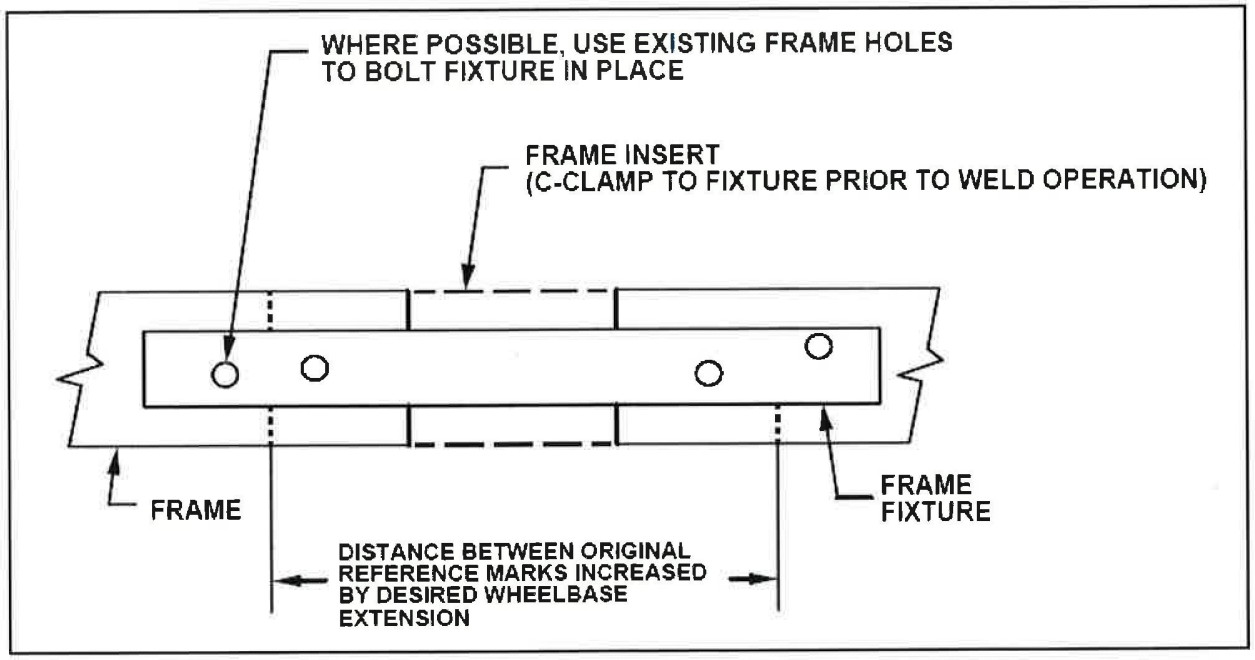


Figure 32 – Welding Fixture

the radius for the band at the upper flange of the frame. (See Figures 35 and 36)

Note: The reinforcement height must also allow for frame rail forms (fuel tank strap depressions in the frame side rail left over from older vehicle options), if applicable, in order to provide a flush fit. The width should not exceed the lower flange width.

- Reinforcement slots or holes must be added to provide extra welding surface area for increased strength.
- The inside reinforcement bend radius must be larger than the outside radius of the frame to provide a gap at the bend. Refer to Figures 35 and 36 for greater detail. Add clearance holes to the reinforcement for all rivets, fasteners, or retention clips in the frame side member.
- Clamp the L-section reinforcement to the outside of the frame rail. There should be no visible gaps between the frame rail and the reinforcement other than at the bend. Fillet weld the reinforcement to the frame rail by using a skip weld technique. (A 2-inch weld followed by a 2-inch space continuous along the reinforcement – See Figures 35 and 36.)
- Leave the corners, bends, and radii "free" to flex. Welding in these locations can create stress risers that often lead to weld cracking.
- Do not weld the lower flange of the frame, neitheron the flange nor at the edge.
- For the final weld operation, fillet weld the reinforcement slots or holes to the frame as shown in Figures 35 and 36. Although perfectly acceptable, it is not necessary to fillet weld the entire circumference of the slots or holes. Performing a fillet weld only on the bottom half (for 180°) will provide sufficient strength.
- After final welding, re-paint the exposed portion of the frame. Apply this re-painting step after all alterations and weldments on the vehicle are complete.
- Duplicate any frame identification number or VIN lost to the stretching or shortening of the wheelbase on the reinforcement or side member of the finished frame.

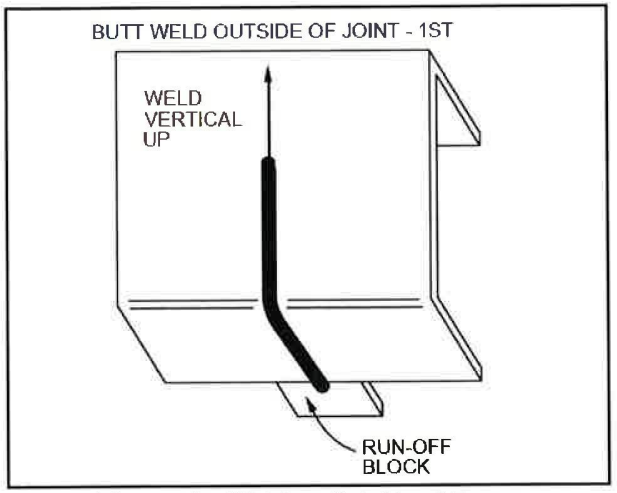


Figure 33 – Welding Outside of Frame

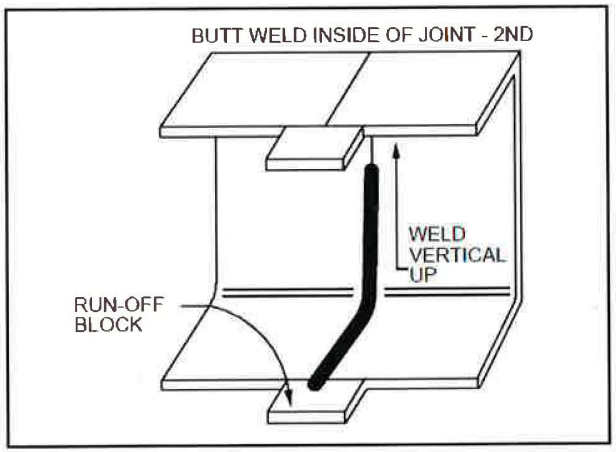


Figure 34 – Welding Inside of Frame

Note: Although Figure 36 ("Minimum Required Method") is acceptable, the method illustrated by Figure 35 ("Preferred Method") is preferred for the reinforcement fabrication and weldment for the following reasons:

- The slots are smaller and can be positioned to avoid clearance holes in the frame more easily.
- The chamfered sides diminish stress concentrations in corners reducing the chance of weld crack propagation.

Aft of Axle Frame Extension

Caution should be taken when lengthening rear frame extensions to avoid adversely affecting vehicle performance in the following areas:

Excessive rear frame extension may cause a customer to significantly unload the front end of the vehicle. This could result in customer dissatisfaction with vehicle braking or steering and handling.

Rear frame extensions need to be long enough to protect vulnerable components such as fuel tanks, and short enough to avoid frame contact with the ground when the vehicle is fully loaded. Refer to the "Ground Clearance" section for greater detail.

If the vehicle has the potential for additional rear loading, such as that resulting from trailer towing, the extension should be completed with both the standard butt weld technique, previously described in the section labeled "Wheelbase Modifications" and a rear extension reinforcement. For rear extension reinforcement plate construction and attachment, refer to Figure 37 and adhere to the following specification:

- Material: Same as frame rails. Frame material and yield strength can be found on the Ford BBAS site (select "Publications", then expand "Vehicle Specifications" and select the applicable vehicle line.
- Size: Height = 4 inches (minimum)
- Length = 12 inches
- Thickness = ¼ inch

Note: The height may vary depending on the particular frame web height. It should not exceed the tangent to the radii at both the upper and lower flanges.

All rear reinforcement plates should be skip welded to the frame in the same manner as previously described.

Method A --- Reinforcements should contain two 1½-inch diameter holes fillet welded to the frame.

Method B --- Reinforcements should contain four 7/16-inch holes for bolting to the frame.

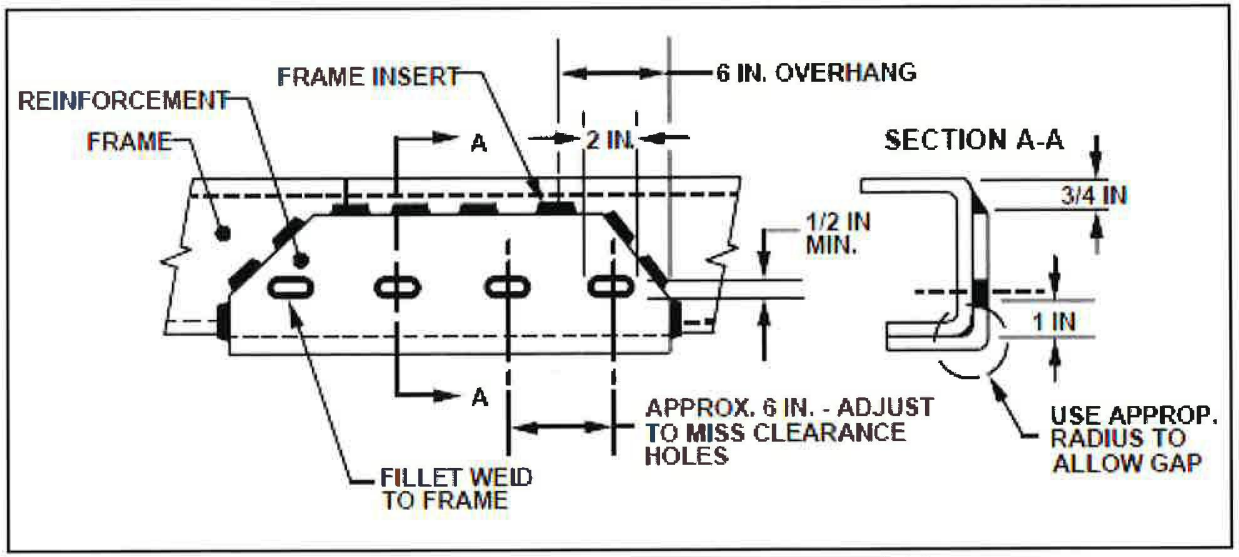


Figure 35 – Preferred Method for Reinforcement and Welding

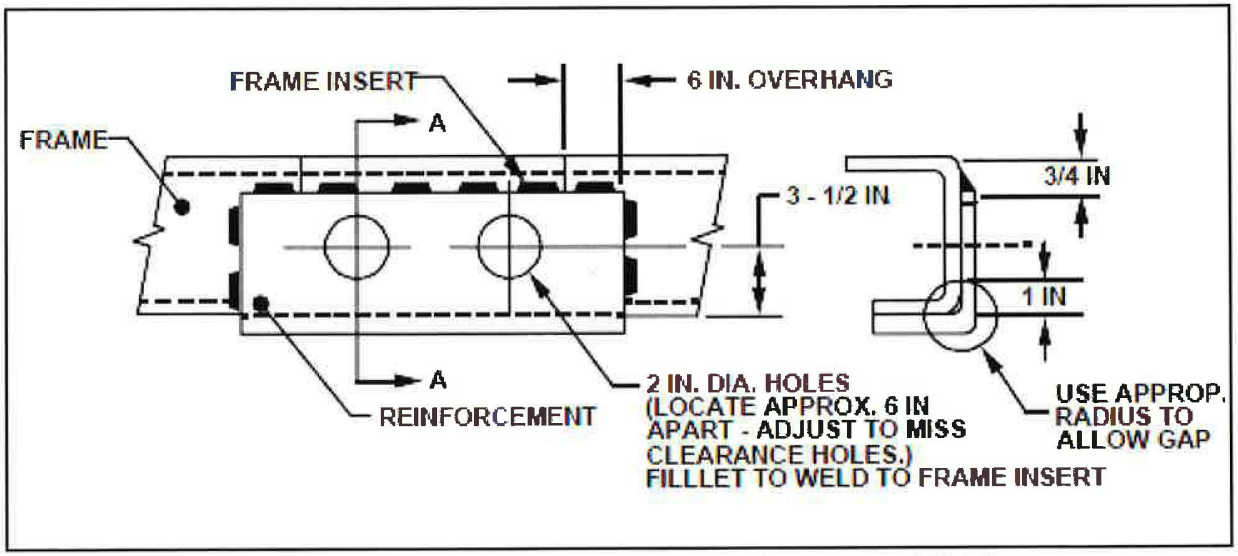


Figure 36 – Minimum Required Method for Reinforcement and Welding

To maintain frame structural integrity, it is strongly recommended that an additional cross member be added to all rear overhang extensions extending 36-inches or more beyond the last OEM cross member.

If it is anticipated that a trailer hitch will be installed on the frame extension, the integrity of the extension and hitch combination should be verified.

If large diameter holes are to be added to the top flange of the rear extension (e.g. for mounting body isolators), a ⅞-inch hole spacing from the outside edge of the frame web and inside edge of the frame must be maintained. This will help to avoid stress cracks in the frame web and upper flange regions.

After final welding, re-paint the exposed portion of the frame.

Ground Clearance

The following will be used to evaluate body builder designs of the rear overhangs relative to ground clearance.

Definition: Angle of Departure - An angle between the ground line and a line formed by points A and B, as shown in Figure 38. It is measured with the vehicle loaded simultaneously to both the front and rear GAWRs. Point A is tangent to the tire Static Loaded Radius (SLR) (SLR values are provided in the program BBLBs). Point B is any point on the vehicle rearward of the rearmost laden tire. The "Primary Departure Angle" defines ground clearance.

Definition: Vulnerable Components - Any part of the vehicle system which is likely to be damaged if the vehicle contacts the ground and, as a result, adversely affects the operation of the vehicle. Ford recommends that a spare tire (if equipped) be considered a vulnerable component, in particular the tire sidewalls, which are more susceptible to damage.

Follow these guidelines when considering ground clearance:

- Vulnerable components should remain within a "protected area" defined as a minimum of 1.25-inches (30 mm) above the Primary Departure Angle (PDA) and no less than 8.25-inches (210 mm) above the ground.
- The PDA will use the end of the frame or rear bumper as Point B. Skid bars may not be used to redefine the PDA. However, a trailer hitch may be used to redefine the PDA under the following conditions:
  - Only Class II, III, or IV hitches can be used to redefine the PDA.
  - The only component of the hitch assembly that may be used to redefine the PDA is a metal hitch mounting cross member that extends the full width of the chassis frame. The hitch mounting brackets and the ball or tube receiver may not be used to redefine the PDA.
  - The trailer hitch assembly must be welded to the chassis frame. If it is otherwise fastened, the trailer hitch cannot be used to redefine the PDA.
- Any "easily removable part", such as a rear entrance step, may extend below the Primary Departure Angle, but should not create a secondary departure angle of less than 9°.
- The exhaust system can extend outside the PDA provided the system is free to lift clear of the departure angle.

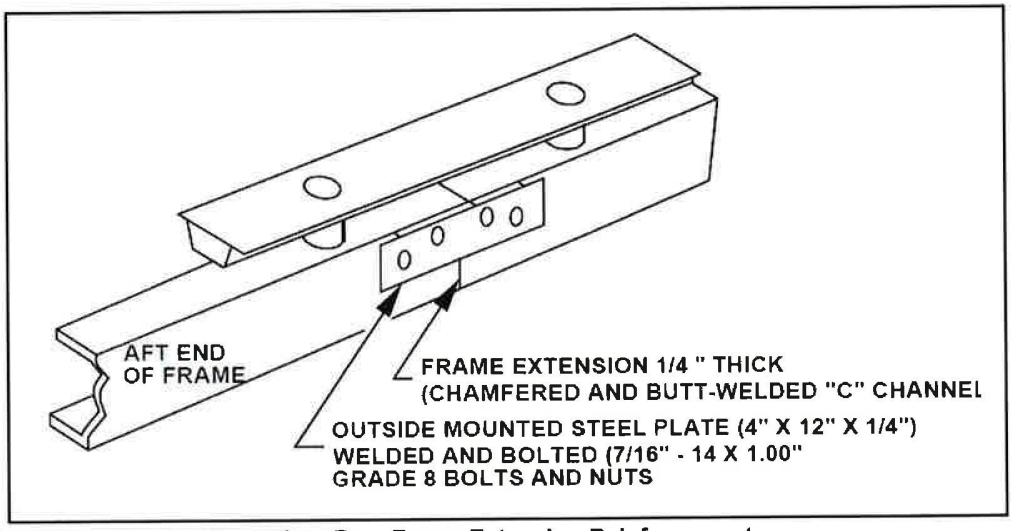


Figure 37 – Rear Frame Extension Reinforcement

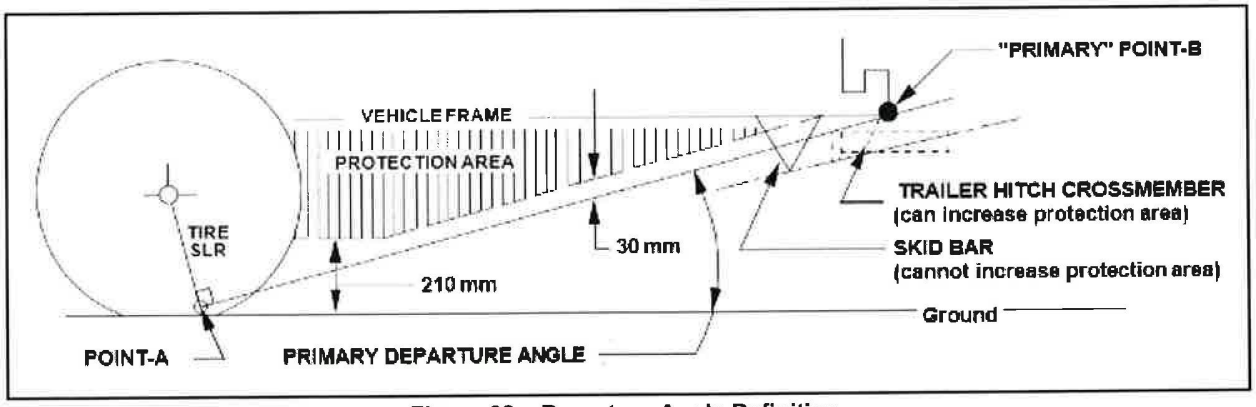


Figure 38 – Departure Angle Definition